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# Mental illness and suicidality after hurricane Katrina

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## ABSTRACT

**Objective** To estimate the impact of hurricane Katrina on mental illness and suicidality by comparing results of a post-Katrina survey with those of an earlier survey.

**Methods** The National Comorbidity Survey-Replication, conducted between February 2001 and February 2003, interviewed 826 adults in the Census Divisions later affected by hurricane Katrina. The post-Katrina survey interviewed a new sample of 1043 adults who lived in the same area before the hurricane. Identical questions were asked about mental illness and suicidality. The post-Katrina survey also assessed several dimensions of personal growth that resulted from the trauma (for example, increased closeness to a loved one, increased religiosity). Outcome measures used were the K6 screening scale of serious mental illness and mild–moderate mental illness and questions about suicidal ideation, plans and attempts.

**Findings** Respondents to the post-Katrina survey had a significantly higher estimated prevalence of serious mental illness than respondents to the earlier survey (11.3% after Katrina versus 6.1% before; $\chi^2_1 = 10.9$; $P < 0.001$) and mild–moderate mental illness (19.9% after Katrina versus 9.7% before; $\chi^2_1 = 22.5$; $P < 0.001$). Among respondents estimated to have mental illness, though, the prevalence of suicidal ideation and plans was significantly *lower* in the post-Katrina survey (suicidal ideation 0.7% after Katrina versus 8.4% before; $\chi^2_1 = 13.1$; $P < 0.001$; suicide plans 0.4% after Katrina versus 3.6% before; $\chi^2_1 = 6.0$; $P = .014$). This lower conditional prevalence of suicidality was strongly related to two dimensions of personal growth after the

trauma (faith in own abilities to rebuild one's life, and realization of inner strength), without which between-survey differences in suicidality were insignificant.

**Conclusions** Despite the estimated prevalence of mental illness doubling after Hurricane Katrina, the prevalence of suicidality was unexpectedly low. The role of post-traumatic personal growth in ameliorating the effects of trauma-related mental illness on suicidality warrants further investigation.

## Introduction

Hurricane Katrina was the deadliest hurricane in the United States in seven decades and the most expensive natural disaster in American history. More than 500 000 people were evacuated. Nearly 90 000 square miles were declared a disaster area (roughly equal to the land mass of the United Kingdom).[1] More than 1 600 confirmed deaths occurred and more than 1 000 people remain missing.[2] The destruction caused by hurricane Katrina has lingered much longer than that occurring after previous hurricanes.[3]

An extensive literature documents the adverse mental health effects of natural disasters.[4,5] Although these effects vary greatly, the effects of catastrophic disasters are consistently large.[6,7] For example, studies after hurricane Andrew in Louisiana in 1992 found that 25–50% of respondents were affected by disaster-related mental disorders.[8,9] Based on these results, and given the extraordinary array of stressors that occurred in conjunction with hurricane Katrina (for example, bereavement, exposure to the dead and dying, personal threats to life, and massive destruction),[10–12] we would expect hurricane Katrina's effects on mental health to be at the upper end of the range of previous disasters.

Due to the wide geographical dispersion of the displaced population, a comprehensive assessment of the mental health of survivors of hurricane Katrina is nonexistent. The Louisiana Department of Public Health documented substantial psychopathology among the 50 000 survivors cared for in evacuation centres shortly after the hurricane,[13] but these individuals

represented less than 1% of survivors. Seven weeks after the hurricane, the United States Centers for Disease Control and Prevention (CDC) carried out a survey to assess household needs and found that half of the adults surveyed who were still living in New Orleans had clinically significant psychological distress,[14] but no information was obtained on the much larger number of residents who had lived in New Orleans before the hurricane who no longer live there. Two public opinion polls, one carried out jointly by Gallup, CNN, and USA Today in a sample of people who sought assistance from the American Red Cross,[15] and the other carried out by the *New York Times* among a sample from the American Red Cross' "safe list" (a list posted on the internet with names and contact information of survivors who were displaced by the hurricane and separated from loved ones),[16] asked a handful of questions about mental health, but did not attempt to assess clinical significance. A probability survey of families with children still residing in trailers (caravans) supplied by the United States Federal Emergency Management Agency (FEMA) or hotel rooms sponsored by FEMA in Louisiana as of mid-February 2006 found that 44% of adult caregivers had clinically significant psychological distress.[17] As with the earlier CDC survey of evacuation centres, though, the sampling frame represented less than 1% of the pre-hurricane residents of the affected areas.

Public health decisions cannot be based on such a narrow empirical foundation. This report presents the initial results of an ongoing tracking survey designed to provide broader coverage of the population affected by hurricane Katrina. The first phase of the study aimed to enroll and carry out a baseline survey of mental health needs among a representative sample of adults (aged ≥ 18) who were pre-hurricane residents in the FEMA-defined impact areas in Alabama, Louisiana and Mississippi.[18–20] Subsequent phases of the study will monitor the evolving needs of this sample in follow-up surveys. The focus of the current report is on the effects of the hurricane on the prevalence and correlates of mental illness and suicidality. Before and after comparisons are approximated by using baseline data from a 2001–03 national survey

that included a probability sub-sample of respondents in the two Census Divisions subsequently affected by Katrina.[21] The questions used to assess mental illness and suicidality were identical in the two surveys.

## Methods

### The samples

The baseline survey was the National Comorbidity Survey-Replication (NCS-R),[21] a face-to-face survey of English-speaking adults aged ≥ 18 administered between February 2001and February 2003. The NCS-R interviewed 826 people in the two Census Divisions later affected by hurricane Katrina. The response rate was 70.9% in the total sample (n = 9282), but a response rate was not calculated separately in the sub-sample of respondents interviewed in the two Census Divisions subsequently affected by hurricane Katrina. The NCS-R data were weighted to adjust for differential probabilities of selection and for residual discrepancies between the sample and the 2000 Census on a series of social, demographic and geographical variables. The NCS-R design is discussed in more detail elsewhere.[22]

The post-Katrina survey was the baseline data collection for the Hurricane Katrina Community Advisory Group (CAG). The CAG is a representative sample of 1043 survivors of hurricane Katrina who agreed to participate in a series of surveys over a period of several years to track the speed and effectiveness of hurricane recovery efforts. The target population for the CAG was English-speaking adults (aged ≥ 18) who before the hurricane lived in the areas subsequently defined by FEMA as affected by hurricane Katrina (a total of 4 137 000 adult residents in the 2000 Census spread across parts of Alabama, Louisiana, and Mississippi) in either of two sampling frames: a random-digit dial telephone frame that included telephone banks working in the eligible counties (in Alabama and Mississippi) and parishes (in Louisiana) in the affected areas before the hurricane; and a frame that included the telephone numbers of the

roughly 1.4 million families from these same areas that applied to the American Red Cross (ARC) for assistance after the hurricane. Pre-hurricane residents of the New Orleans metropolitan area were over-sampled in both frames. Many displaced people were traced in the random-digit dial sample because phone calls were forwarded to new addresses. The ARC sample also included cell phones. The small proportion of evacuees still living in hotels at the time of the survey was represented through a supplemental sample of hotels that housed evacuees supported by FEMA.

The overlap of the two sampling frames was handled in two ways: by confining numbers from the ARC frame to those not in the random-digit dial frame (for example, cell phones and exchanges outside the hurricane area) and by down-weighting those respondents selected by the random-digit dial frame who reported receiving assistance from the ARC and had additional phone numbers outside the random-digit dial frame. Respondents from the two frames were combined by weighting the participating households in the ARC sample to their estimated population proportion based on estimates of the proportion of ARC numbers outside the random-digit dial frame and the proportion of random-digit dial respondents that asked for assistance from the ARC. Respondents in the hotel sample were included without a household weight because they were selected proportionally.

The final sample of 1043 CAG members was recruited from an initial sample that we estimate to have included 3835 eligible pre-hurricane households selected across the two frames. We were able to contact and determine 2489 of these households to be eligible. The estimate that there were 3835 eligible pre-hurricane households in the sample is nothing more than an estimate because we were unable to contact a large proportion of this number even after many contact attempts, leading us to sub-sample hard-to-reach cases for especially intensive tracing efforts and to estimate rather than to confirm the proportion of eligible households. If the estimate of 3835 is correct, the 2489 households we contacted and determined to be eligible represent a 64.9%

screening response rate. This screening response rate is lower than in typical household surveys because of the massive geographic dislocation of the post-Katrina population and the attendant difficulties with tracing and contacting people in this population. For example, some of the phone numbers in the ARC sample frame were to rooms in hotels where a family was temporarily living at the time they sought ARC assistance. While we were able to trace some such households when they left forwarding information, this was often not possible, leading to a low survey screening response rate.

A short screening questionnaire was administered to a random respondent in each of the households that we contacted in the screening sample in order to determine eligibility for the CAG. This screening questionnaire included questions about location of pre-hurricane residence, extent of exposure to the hurricane, current mental health, and basic demographics. Once these screening survey questions were answered, respondents determined to be eligible by virtue of their pre-hurricane residence were introduced to the purposes and goals of the CAG and informed that agreement to join the CAG required a commitment to participate in a number of follow-up surveys over a period of several years as well as to provide tracing information that would allow us to follow them if they changed residences over the study period. We asked respondents to consider these requirements carefully before agreeing to participate, as we wanted the CAG to include only respondents who would participate on an ongoing basis in the repeated tracking surveys.

The 1043 respondents who agreed to join the CAG were administered the baseline CAG survey, the results of which are presented in this report. These respondents represent 41.9% (1043/2489) of the screening questionnaire sample. Although this is a relatively low response rate in comparison to typical one-shot telephone surveys, it is considerably higher than the response rates obtained in more conventional consumer panel surveys (www.globalopinionpanels.com; www.us.acnielsen.com). It is noteworthy that responses to the

screening questionnaire were quite similar among those who agreed to join the CAG compared to those who declined. A weight was nonetheless applied to the CAG sample to adjust for observed differences between CAG respondents and non-respondents in terms of screening questionnaire reports due to a somewhat higher level of trauma exposure and a somewhat higher prevalence of hurricane-related psychological distress among non-participants than CAG members in the screening questionnaire. In addition, a within-household probability of selection weight was applied to the CAG sample to adjust for the fact that only one random household member was invited to join the CAG in each eligible household. In addition, a post-stratification weight was applied to the data to adjust for residual discrepancies between the CAG and the 2000 Census population of the affected areas on a range of social, demographic and pre-hurricane housing variables. The consolidated CAG sample weight, finally, was trimmed to increase design efficiency based on evidence that trimming did not significantly affect prevalence estimates of outcome variables.

**Measures**

The K6 scale of non-specific psychological distress[23,24] was used to screen for anxiety and mood disorders occurring within 30 days of the interview as defined by the *Diagnostic and Statistical Manual of Mental Disorders,* fourth edition (DSM-IV). The K6 is the most widely used mental health screening scale in the United States.[25,26] Scores on the scale range from 0 to 24. Based on previous K6 validation,[24] scores in the range 13–24 were classified probable serious mental illness, those in the range 8–12 were classified probable mild–moderate mental illness, and those in the range 0–7 were classified probable non-cases. A small clinical reappraisal study was carried out with five respondents selected randomly from each of the three categories (serious mental illness, mild–moderate mental illness, non-case). A trained clinical interviewer administered the non-patient version of the Structured Clinical Interview for DSM-IV,[27] blinded to the category of each of the 15 respondents. The syndromes assessed were DSM-IV major

depressive episode, panic disorder, generalized anxiety disorder, post-traumatic stress disorder, agoraphobia, social phobia and specific phobia. Serious mental illness was defined as a DSM-IV diagnosis with a global assessment of functioning[28] score of 0–60 and mild–moderate mental illness as a DSM-IV diagnosis with a global assessment of functioning of ≥61. K6 classifications were confirmed for 14 of 15 respondents, the exception being a respondent classified as having severe mental illness by the K6 but mild–moderate mental illness by the structured interview (based on a global assessment of functioning score of 65). Suicidality was assessed by questions about lifetime occurrence of suicidal thoughts, plans, and attempts, age of first occurrence of each of these outcomes, and recency of each outcome. Respondents were classified as first-onset cases with respect to each of these outcomes if they reported that the outcome occurred for the first time in their life within the past 12 months (the most recent time frame assessed in the NCS-R).

Socio-demographic correlates assessed included age, sex, race and ethnicity, family income, education, marital status and employment status. Income was coded into a dichotomy for below the population median of the income-per-family-member ratio versus at or above the median of that ratio. We also included measures of several dimensions of personal growth occurring after the hurricane (post-traumatic personal growth) that have been found in previous research to occur after exposure to trauma and to facilitate psychological adjustment by making sense of the trauma or finding some positive aspect to the trauma.[29,30] We focus on five such dimensions based on their presence in the two most commonly used inventories of post-traumatic personal growth[31,32]: post-traumatic increases in emotional closeness to loved ones, faith in one's ability to rebuild one's life, spirituality or religiosity, meaning or purpose in life, and recognition of inner strength or competence.

**Analysis**

Differences in the estimated prevalence of mental illness and suicidality were compared between the NCS-R and the post-Katrina baseline CAB survey. Socio-demographic variation in between-survey differences was assessed using pooled logistic regression equations predicting outcomes from a 0–1 variable for survey (0 = NCS-R, 1 = post-Katrina survey), the socio-demographic variables, and interactions between the survey and socio-demographic variables. Logistic regression coefficients and their standard errors were exponentiated to create odds-ratios (ORs) and their 95% confidence intervals. The role of post-traumatic growth was examined in a subgroup analysis. Because both surveys featured weighting and geographical clustering (NCS-R), analyses used the Taylor series linearization method.[33] Multivariate significance was calculated using Wald $\chi^2$ tests based on design-corrected coefficient variance–covariance matrices. Statistical significance was evaluated using two-sided 0.05 level tests.

## Findings

### Prevalence of mental illness and suicidality

The proportion of respondents estimated to have serious mental illness is significantly higher among those in the post-Katrina sample than the NCS-R (11.3% after Katrina versus 6.1% before; $\chi^2_1 = 10.9$; $P = 0.001$). The same is true for the proportion estimated to have mild–moderate mental illness (19.9% after Katrina versus 9.7% before; $\chi^2_1 = 22.5$; $P < 0.001$) and those estimated to have any mental illness (31.2% after Katrina versus 15.7% before; $\chi^2_1 = 35.9$; $P < 0.001$), with ORs in the range 2.0-2.4 (Table 1). The difference between the surveys in suicidality is not significant either for ideation (2.9% after Katrina versus 2.8% before; $\chi^2_1 = 0.0$; $P = 0.96$), plans (0.7% after Katrina versus 1.1% before; $\chi^2_1 = 0.4$ $P = 0.54$) or attempts (0.7% after Katrina versus 0.6% before; $\chi^2_1 = 0.0$; $P = 0.88$).

Suicidal ideation, plans, and attempts during the 12 months before the interview were reported in both samples almost entirely by people estimated to have mental illness (results

available on request). As a result, the higher estimated prevalence of mental illness but not suicidality in the post-Katrina sample implies that the conditional prevalence of suicidality given probable mental illness is lower among those in the post-Katrina sample than among those sampled before the hurricane. More detailed analysis found that this was especially true for the first onset of suicidality during the past year among respondents with probable mental illness (Table 2). These differences are significant for ideation (0.7% after Katrina versus 8.4% before; $\chi^2_1 = 13.1$; $P < 0.001$) and plans (0.4% after Katrina versus 3.6% before; $\chi^2_1 = 6.0$; $P < 0.014$) but not for attempts (0.8% after Katrina versus 2.3% before; $\chi^2_1 = 1.9$; $P = 0.17$).

**Socio-demographic correlates of mental illness and suicidality**

Significant socio-demographic correlates of serious mental illness among those in the post-Katrina sample include being Non-Hispanic White, not married before the hurricane, and classified as having an "other" employment status (mainly including unemployed and disabled people) before the hurricane (Table 3). The only one of these associations that differs significantly in the post-Katrina sample compared to the NCS-R is a higher prevalence of serious mental illness among people who were not married after Katrina than before. Suicidal ideation was the focus of subsequent analysis of suicidality because suicide plans and attempts were too uncommon to be studied with adequate statistical power. The only statistically significant socio-demographic correlates of ideation are being 18-39 years of age and Non-Hispanic White. (Table 3). The second of these two associations is significantly higher in the post-Katrina sample than in the NCS-R.

**Post-traumatic growth and suicidal ideation**

Most respondents to the post-Katrina survey reported the following types of post-traumatic growth: becoming closer to their loved ones (81.6% [824/1043 in the unweighted data]), developing faith in their own abilities to rebuild their lives (95.6% [984/1043 in the unweighted

data]), becoming more spiritual or religious (66.8% [655/1043 in the unweighted data]), finding deeper meaning and purpose in life (75.2% [752/1043 in the unweighted data]), and discovering inner strength (69.5% [707/1043 in the unweighted data]) (Table 4). The probabilities of two of these five vary significantly with mental illness: a comparatively low probability of finding deeper meaning and purpose in life among people estimated to have mental illness; and a comparatively high probability of discovering inner strength among people estimated to have mild-moderate mental illness.

Two of the five dimensions of post-traumatic growth are significantly related to low prevalence of suicidal ideation among people thought to have mental illness; belief in their own abilities to recover and discovery of inner strength (Table 5). The lower prevalence of suicidal ideation in the post-Katrina sample than the NCS-R is limited to those who reported these two aspects of post-traumatic growth, among whom the OR compared to the NCS-R is a statistically significant 0.2. The prevalence of suicidal ideation among mentally ill post-Katrina respondents with neither of these cognitions, in comparison, does not differ significantly from the prevalence among comparable respondents in the NCS-R, with a statistically insignificant OR of 1.1.

## Conclusion

The two-survey comparison method is an inexact way to estimate the effects of hurricane Katrina because the surveys differed in their sampling frames (all households in two Census Divisions in the NCS-R versus households contactable by telephone in areas within these divisions affected by the hurricane in the post-Katrina survey), mode of data collection (face-to-face versus telephone interviews) and response rates. An additional limitation concerns the K6. Although good concordance with clinical interviews has been consistently documented in published reports,[23,24] the K6 is merely a screening tool and not a clinical interview.

Notwithstanding these limitations, the fact that the estimated prevalence of serious mental illness and mild–moderate mental illness doubled after hurricane Katrina is consistent with other evidence of adverse mental health effects of major disasters.[34,35] The socio-demographic correlates are also largely consistent with previous research.[36,37] That the associations among socio-demographic correlates were largely the same across samples suggests that the adverse mental health effects of hurricane Katrina were equally distributed across broad segments of the population. Although an analysis of treatment patterns goes well beyond the scope of this report, these results document a high and widely dispersed need for mental health treatment.

Our most striking finding is the lower conditional likelihood of suicidality among people believed to have mental illness after Katrina compared to before. This finding is not unprecedented. A cross-national epidemiological survey of suicidal ideation found that war-torn Beirut during the first Lebanon-Israeli war had a lower prevalence of suicidal ideation than any other country studied despite having a higher prevalence of depression than virtually any other study site.[38] While post hoc methodological interpretations can be constructed (for example, that mental illness associated with exposure to trauma might have a lower intensity that is not detected by standard measures), they seem implausible in light of independent evidence that the severity and impairment of mental illness occurring after disasters are similar when compared with those occurring at other times.[39,40]

A more plausible explanation is that the effects of increased mental illness after Katrina on suicidality were offset by protective factors activated by the hurricane. Although this possibility has not been studied in previous trauma studies, post-traumatic personal growth in areas such as self-efficacy,[41] optimism,[30] hope[42] and perceived social support[43] have been documented after disasters, and these changes have been linked to low levels of post-disaster distress.[44] Our findings go beyond these earlier results, though, to suggest that some dimensions of post-traumatic personal growth might be protective against suicidality among people with

clinically significant mental illness. It is noteworthy that the indicators of post-traumatic growth were not strongly related to our estimates of mental illness, which means that a great many survivors of Katrina are, understandably, depressed by their losses and anxious about their future despite experiencing post-traumatic personal growth. However, the suicidality often associated with these syndromes in the general population is much lower among people in the post-Katrina sample who were able to develop a belief in their ability to rebuild their life and a perception of inner strength in the wake of the hurricane. The causal processes underlying this pattern presumably involve the creation of positive orientations towards the future that provide psychological scaffolding that protects against the suicidality often associated with extreme distress. Although processes of this sort have long been discussed in the psychoanalytic literature,[45,46] the current study is, to our knowledge, the first to provide quantitative evidence regarding such a pattern in an epidemiological sample of a population that has survived a disaster.

This finding suggests that further systematic investigation of post-traumatic personal growth might be useful in guiding public health efforts delivered through the mass media in the aftermath of disasters. Research has suggested that public health messages play an important part in affecting psychological reactions to disasters.[47–49] The promotion of positive cognitions might be an important pathway for these effects. Systematic research to explore this possibility is needed. In a more immediate way, this finding documents a psychological strength in the population affected by hurricane Katrina that is, at least temporarily, linked to an unexpectedly low prevalence of suicidality. It is important for public health officials to recognize, though, that this low prevalence of suicidality might be temporary. For example, if the feelings of inner strength reported by so many respondents are linked to an expectation that the practical problems of living created by the hurricane will soon be resolved, and if these expectations are not met as time goes on, one could imagine that the positive cognitions will erode and be replaced with a

sense of hopelessness that, in the presence of the high estimated levels of mental illness found here, could lead to a substantial increase in suicidality. The finding of a low prevalence of suicidality, then, should be considered evidence of a short-term postponement rather than of a permanent absence of suicidality in this population.

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**Table 1. Estimated prevalence of mental illness within the past 30 days as classified by DSM-IV and prevalence of suicidality within the past 12 months in the National Comorbidity Survey-Replication (NCS-R), February 2001–February 2003, and the post-Katrina survey, 19 January – 31 March 2006**

| | Survey | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | NCSR[a] | | | Post-Katrina[a] | | | Katrina: NCS-R[b] | | | |
| | % | (n) | (se) | % | (n) | (se) | OR | (95% CI) | $\chi^2_1$ | (p) |
| I. Mental Illness (30-day prevalence)[c] | | | | | | | | | | |
| Serious mental illness (SMI) | 6.1 | (91) | (0.7) | 11.3[d] | (113) | (1.7) | 2.0[d] | (1.3-3.0) | 10.9[d] | (.001) |
| Mild/Moderate mental illness (MMI) | 9.7 | (131) | (1.0) | 19.9[d] | (206) | (2.1) | 2.3[d] | (1.6-3.3) | 22.5[d] | (<.001) |
| Any mental illness | 15.7 | (222) | (1.2) | 31.2[d] | (319) | (2.4) | 2.4[d] | (1.8-3.2) | 35.9[d] | (<.001) |
| II. Suicidality (12-month prevalence) | | | | | | | | | | |
| Ideation | 2.8 | (45) | (0.4) | 2.9 | (30) | (0.9) | 1.0 | (0.5-2.1) | 0.0 | (.96) |
| Plan | 1.1 | (19) | (0.3) | 0.7 | (4) | (0.5) | 0.6 | (0.1-2.9) | 0.4 | (.54) |
| Attempt | 0.6 | (10) | (0.2) | 0.7 | (5) | (0.5) | 1.1 | (0.2-5.3) | 0.0 | (.88) |
| (n)[e] | | (826) | | | (1043) | | | (1869) | | |

[a]Values are the percentage (standard error) of respondents who met criteria for the outcome. All values are based on weighted data.
[b]Values are the odds-ratio (95% confidence interval) of the outcome in the post-Katrina survey (numerator) versus the NCS-R (denominator).
[c]Prevalence of mental illness is estimated using scores from K6 screening scale. See text for details.
[d]Difference between the two surveys is significant at the 0.05 level with a two-sided test.
[e]Unweighted sample size

**Table 2. Prevalence of first onset of suicidality during the past year among respondents with probable mental illness during the past 30 days as classified by DSM-IV[a] in the National Comorbidity Survey-Replication (NCS-R), February 2001–February 2003, and the post-Katrina survey, 19 January – 31 March 2006**

| | Survey | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | NCS-R[b] | | | Post-Katrina[b] | | | Katrina: NCS-R[c] | | | |
| | % | ($n_1$/ $n_2$) | (se) | % | ($n_1$/ $n_2$) | (se) | OR | (95% CI) | $\chi^2_1$ | (p) |
| Ideation | 8.4 | (15/147) | (2.3) | 0.7[d] | (4/255) | 0.4 | 0.1[d] | (0.0-0.3) | 13.1 | (<.001) |
| Plan | 3.6 | (9/191) | (1.3) | 0.4 [d] | (2/287) | 0.3 | 0.1[d] | (0.0-0.6) | 6.0 | (.014) |
| Attempt | 2.3 | (5/183) | (1.2) | 0.8 | (4/285) | 0.5 | 0.3 | (0.1-1.6) | 1.9 | (.17) |

[a]Prevalence of mental illness is estimated using scores from K6 screening scale. See text for details.
[b]Values are the percentage (numerator/denominator) (standard error) of respondents who met criteria for the outcome described in the row heading among those with probable mental illness and no past history of the outcome. All percentages and standard errors are based on weighted data. The numerator and denominator are based on unweighted data.
[c]Values are the odds-ratio (95% confidence interval) of the estimated outcome in the post-Katrina survey (numerator) versus the NCS-R (denominator).
[d]Difference between the two surveys is significant at the 0.05 level with a two-sided test.

**Table 3. Sociodemographic predictors of probable serious mental illness during the past 30 days as classified by DSM-IV and of suicidal ideation among people with probable mental illness in the National Comorbidity Survey-Replication (NCS-R), February 2001–February 2003, and the post-Katrina survey, 19 January – 31 March 2006[a]**

| | Serious Mental Illness[b,c] | | | | Suicidal Ideation[b,c] | | | |
|---|---|---|---|---|---|---|---|---|
| | Main Effects | | Katrina Interaction | | Main Effects | | Katrina Interaction | |
| | OR | (95% CI) | OR | (95% CI) | OR | (95% CI) | OR | (95% CI) |
| Age | | | | | | | | |
| 18-39 | 1.4 | (0.4-4.7) | 0.4 | (0.1-1.9) | 11.4 | (2.5-52.4) | 4.5 | (0.8-26.3) |
| 40-59 | 2.2 | (0.8-6.5) | 0.3 | (0.1-1.7) | --[d] | -- | --[d] | -- |
| ≥ 60 | 1.0 | -- | 1.0 | -- | 1.0 | -- | 1.0 | -- |
| $\chi^2_{2/1}$ (p) | 2.7 (.26) | | 1.7 (.42) | | 9.7[e] (.002) | | 2.8 (.09) | |
| Sex | | | | | | | | |
| Female | 1.9 | (0.9-4.1) | 0.9 | (0.3-2.7) | 1.4 | (0.3-7.5) | 0.8 | (0.1-5.8) |
| Male | 1.0 | -- | 1.0 | -- | 1.0 | -- | 1.0 | -- |
| $\chi^2_1$ (p) | 2.6[e] (.11) | | 0.0 (.90) | | 0.2 (.66) | | 0.0 (.86) | |
| Race | | | | | | | | |
| Non-Hispanic White | 1.0 | -- | 1.0 | -- | 1.0 | -- | 1.0 | -- |
| Non-Hispanic Black | 0.5[e] | (0.2-0.9) | 1.8 | (0.7-5.0) | 0.2[e] | (0.0-0.9) | 0.2 | (0.0-1.0) |
| Hispanic or Other | 0.1[e] | (0.0-0.5) | 0.4 | (0.8-2.4) | 0.0[e] | (0.0-0.4) | 0.0[e] | (0.0-0.5) |
| $\chi^2_2$ (p) | 10.3[e] (.006) | | 2.7 (.26) | | 8.5[e] (.014) | | 7.8[e] (.020) | |
| Pre-hurricane income | | | | | | | | |
| Below Median | 1.6 | (0.6-4.5) | 1.6 | (0.6-4.4) | 1.6 | (0.2-10.6) | 4.6 | (0.7-31.2) |
| At or above median | 1.0 | -- | 1.0 | -- | 1.0 | -- | 1.0 | -- |
| $\chi^2_1$ (p) | 0.9 (.35) | | 0.8 (.36) | | 0.2 (.64) | | 2.4 (.12) | |
| Education | | | | | | | | |
| 0-11 (less than high school) | 4.1 | (0.9-18.2) | 2.6 | (0.6-11.7) | 1.4 | (0.1-13.4) | 6.7 | (0.6-70.5) |
| 12 (high school) | 1.9 | (0.5-7.2) | 1.0 | (0.2-4.6) | 0.6 | (0.1-3.8) | 1.5 | (0.2-14.5) |
| 13-15 (some university) | 2.4 | (0.7-8.4) | 1.1 | (0.2-4.8) | 1.6 | (0.3-7.8) | 2.1 | (0.2-17.6) |
| ≥ 16 (university graduate) | 1.0 | -- | 1.0 | -- | 1.0 | -- | 1.0 | -- |
| $\chi^2_3$ (p) | 4.2 (.24) | | 3.5 (.32) | | 1.6 (.67) | | 2.8 (.43) | |
| Pre-hurricane marital status | | | | | | | | |
| Previously Married | 7.4[e] | (3.6-15.1) | 3.7[e] | (1.4-9.5) | 1.8 | (0.4-8.7) | 1.1 | (0.2-7.8) |
| Never Married | 8.8[e] | (3.3-23.7) | 6.5[e] | (2.1-19.8) | 1.3 | (0.3-6.4) | 0.7 | (0.1-5.6) |
| Married/cohabiting | 1.0 | -- | 1.0 | -- | 1.0 | -- | 1.0 | -- |
| $\chi^2_2$ (p) | 33.7[e] (<.001) | | 13.4[e] (.001) | | 0.5 (.77) | | 0.1 (.94) | |
| Pre-hurricane employment status | | | | | | | | |
| Employed | 1.0 | -- | 1.0 | -- | 1.0 | -- | 1.0 | -- |
| Retired | 0.9 | (0.2-3.5) | 1.3 | (0.2-9.4) | --[f] | -- | --[f] | -- |
| Student | 0.4 | (0.0-4.5) | 0.5 | (0.0-8.4) | --[f] | -- | --[f] | -- |
| Homemaker | 1.3 | (0.4-4.7) | 0.7 | (0.1-3.3) | 2.8 | (0.3-25.9) | 0.5 | (0.0-5.9) |
| Other | 3.3[e] | (1.6-6.6) | 0.9 | (0.4-2.4) | 2.6 | (0.6-11.4) | 0.8 | (0.1-4.3) |
| $\chi^2_{4/2}$ (p) | 14.4[e] (.006) | | 0.6 (.97) | | 1.6 (.46) | | 0.3 (.85) | |
| (n)[g] | (1043 ) | | (1869) | | (286) | | (479) | |

[a] Prevalence of serious mental illness is estimated using scores from K6 screening scale. See text for details.
[b] The main effects model is based on a single logistic regression equation that includes all socio-demographics and is estimated only in the Katrina sample (1043 respondents in the total sample to predict serious mental illness and 286 with any mental illness to predict suicidal ideation). The interaction model is estimated in the two samples combined (1043 plus the 826 NCS-R respondents, for a total of 1869 to predict serious mental illness; 286 plus the 193 NCS –R respondents, for a total of 479 to predict suicidal ideation), with a dummy predictor variable for sample (post-Katrina or NCS-R), all socio-demographics, and interactions between the dummy variable (post-Katrina coded 1 and NCS-R coded 0) and socio-demographics. Sample sizes reported here are unweighted.

[c] Values are odds-ratio (95% confidence interval) of the estimated outcome in the post-Katrina survey (numerator) versus the NCS-R (denominator). These values are based on weighted data.
[d] Age categories were collapsed to 18–39 and ≥40 owing to sparse data for estimating the relatively rare outcome.
[e] Significant at the 0.05 level with a two-sided test.
[f] In the subsample of respondents estimated to have a mental illness, no student or retired person reported suicidal ideation in either survey.
[g] Unweighted sample size

**Table 4. Proportion of participants in post-Katrina survey, 19 January – 31 March 2006, who reported post-traumatic personal growth in five domains as a function of probable mental illness during the past 30 days as classified by DSM-IV (See text for further details.)**

| | Total Post Katrina Sample[b] | | | Subsamples as a function of mental illness[c] | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | SMI | | | MMI | | | Any | | | None | | | | |
| Domain[a] | % | (n) | (se) | % | (n) | (se) | % | (n) | (se) | % | (n) | (se) | % | (n) | (se) | $\chi^2_2$ | (p) |
| Became closer to loved ones | 81.6 | (824) | (2.1) | 69.3 | (83) | (8.6) | 83.0 | (160) | (4.3) | 78.0 | (243) | (4.3) | 83.2 | (581) | (2.2) | 2.2 | (.34) |
| Developed faith in ability to rebuild life | 95.6 | (984) | (1.0) | 85.5 | (97) | (5.2) | 96.7 | (189) | (1.2) | 92.6 | (286) | (2.0) | 97.0 | (698) | (1.1) | 4.6 | (.10) |
| Became more spiritual or religious | 66.8 | (655) | (2.5) | 72.7 | (88) | (6.5) | 72.1 | (141) | (5.6) | 72.3 | (229) | (4.4) | 64.3 | (426) | (3.0) | 2.4 | (.31) |
| Found deeper meaning and purpose in life | 75.2 | (752) | (2.3) | 82.1 | (90) | (5.6) | 84.0 | (163) | (4.2) | 83.3 | (253) | (3.4) | 71.6 | (499) | (2.9) | 6.7[d] | (.037) |
| Discovered inner strength | 69.5 | (707) | (2.5) | 71.2 | (81) | (8.2) | 86.9 | (162) | (3.6) | 81.2 | (243) | (4.0) | 64.2 | (464) | (3.0) | 18.3[d] | (<.001) |
| (n) | | (1043) | | | (113) | | | (206) | | | (319) | | | (724) | | | |

[a]Participants were asked the extent to which their experiences in the hurricane lead them to experience changes in each domain. Response options were “a lot,” “some,” “a little,” and “not at all.”
[b]Values are percentage (numerator) (standard error). The percentage and standard error are based on weighted data and the numerator on unweighted data.
[c]Prevalence of mental illness is estimated using scores from K6 screening scale. See text for details.
[d]Significant at the 0.05 level with a two-sided test.

**Table 5. Comparison of prevalence of suicidal ideation during the past year among those with probable mental illness during the past 30 days and post-traumatic increase in faith in own abilities to rebuild one's life and discovery of inner strength compared to those without post-traumatic increase, post-Katrina survey, 19 January–31 March 2006, in relation to prevalence of suicidal ideation among those with probable mental illness during the past 30 days in the National Comorbidity Survey-Replication, February 2001 – February 2003[a]**

| Faith in own abilities and discovery of inner strength | NCS-R[b] | | | Post-Katrina[b] | | | Katrina: NCS-R[c] | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | % | ($n_1$/ $n_2$) | (se) | % | ($n_1$/ $n_2$) | (se) | OR | (95% CI) | $\chi^2_1$ | (p) |
| Yes | 14.7 | (38/222) | 2.4 | 2.9 | (13/199) | 1.0 | 0.2 | (0.1-0.4) | 18.9[d] | (<.001) |
| No | 14.7 | (38/222) | 2.4 | 16.5 | (14/120) | 6.8 | 1.1 | (0.4-3.2) | 0.1 | (.80) |
| Total | 14.7 | (38/222) | 2.4 | 7.0 | (27/319) | 2.3 | 0.4 | (0.2-1.0) | 4.2[d] | (.040) |

[a]Estimated using scores from K6 screening scale. See text for details.
[b]Values are percentage (numerator/denominator) (standard error). The percentage and standard error are based on weighted data. The number and denominator are based on unweighted data.
[c]Values are odds ratio (95% confidence interval) of the estimated outcome in the post-Katrina survey (numerator) versus the NCS-R (denominator).
[d]Difference between the two surveys is significant at the 0.05 level with a two-sided test.